AFI	AFFECTED AREAS: FABRIC TOWER ROOM   EFFECTIVE DAT	TE: 11/14/96
API	APPROVALS: PRODUCTION ENGINEERING	Q.C.
API	APPROVALS: PRODUCTION ENGINEERING	(

#### **PROCEDURE**

OBJECTIVE: To define the standard startup procedure for operation of fabric coating towers being used to coat PTFE on glass cloth.

AFFECTED EQUIPMENT:

All fabric towers.

#### **STEPS:**

#### 1.0 Setup

- 1.1 Obtain the material to be coated; bare glass if first pass, coated fabric if subsequent pass. The operator must double check run numbers, roll numbers, pass number, yardage, glass style, greige vs heat cleaned, etc. to be sure that the correct material is being set-up for coating.
- 1.2 If the roll being coated has already received one or more passes, a filled-out run sheet will accompany the roll. If the tower on which subsequent passes are to be applied is the same as the one on which the initial passes were applied, continue recording run data on the filled-out sheet. If the roll is bare glass, or if subsequent passes are being applied on a different tower, locate the standard process sheet for the product being made.
- 1.3 Operators are responsible for producing quality material and must make adjustments necessary to maintain quality. Any deviations from standard must be communicated to the leadsman and next shift operator. The leadman must then make sure that the manufacturing Engineer is aware of all deviations from standard conditions. All changes and problems *must* be noted on the Run Sheet. The notes should say the pass at which the problem occurred, the yardage point as well as yards affected, steps taken to try to correct the problem and the operator's initials.

- 1.4 Fill out top of standard run sheet including date, fabric supplier, case number and supplier yardage and tower used.
- 1.5 Set all heater and blower controls to the settings, shown on the standard process sheet, for the pass about to be coated.
- 1.6 Obtain the mix required for the pass as indicated on standard process sheet. On thick mixes, double check the specific gravity, viscosity, and Ph and record them on the run sheet. Note on the run sheet the mix lot number used as well as the mix number.

- 1.7 Set the proper coating speed.
- 1.8 The bottom coating bar should be clean and secure in place.
- 1.9 Place the roll to be coated onto the air shaft at the back (take-off) of the tower. Adjust roll to proper position on shaft. There should be a mark or ruler at the let-off stand to indicate proper placement. It is critical that the payoff roll is aligned with the takeup roll to prevent wrinkling. Fill air shaft with air to secure roll. Attach air brake, set air brake pressure to zero (0).
  - 1.10 Thread material around bottom bar to just above metering bars.
- 1.11 Once above the metering bars, staple the material to the leader. First secure the two webs evenly together by hand and staple a row across the fill width, applying one staple every 3". Fold the splice over and restaple a double row with a few extra staples on each edge. This is a two-man procedure. Jog the drive motor until the splice is pulled tight. Respell any baggy spots so there is even tension across the full width of the splice.
  - 1.12 Raise coating pan. Be sure the bottom valve is closed.
  - 1.13 Attach fill funnel to the pan and line the funnel with filter cloth.
- 1.14 Select proper metering bars, (smooth vs. wire). If opposed metering bars used, set gap indicated on run sheet. Make sure that spacers are clean and free of any accumulation that may change the gap.
  - 1.15 Fill pan to within 2" of top with dispersion.
  - 1.16 While filling pan, turn on power to the heater control units, input air blower, and exhaust blower.
- 1.17 On I/R towers, if there are any delays before startup greater than 10 min., then shut off zones set over 1000°F to avoid burning the leader and heating up the dispersion.
- 1.18 If first pass (second pass on silicone treated fabrics), have sharp blades ready for trimming.
- 1.19 Place thick-walled cores on upper and lower "Nim-Cor" shafts at the take-up stand.
- 1.20 Have several pieces of masking tape ready to tape leader and material to take-up cores and to label QC samples of coated material.

#### 2.0 Start-Up

2.1 Double check all parameters and entire set-up procedure before proceeding with start-up.

- 2.2 On I/R towers, when the heating zones are up to 100° F of their set temperature, start take-up drive.
- 2.3 Observe coated fabric before and after metering bars. Tear-out prevention critical on opposed bar setups, especially on first pass.

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2.4 After splice has passed trim knives, if first pass, engage knives and adjust proper width.

to

- 2.5 Turn up let-off brake pressure until roll unwinds smoothly with moderate tension.
  - 2.5.1 Feel tension across the web by hand.
- 2.5.2 If tension is uneven, then adjust position of let-off shaft holder by turning support screws.
- 2.6 Once good coated material has passed through the take-up nip, cut it from leader.

the

2.7 Position new core at take-up so it is aligned with the web and attach web with tape. If running "tape" (355, or 349) have one edge of web flush will allow material to be stored standing on end.

with end of core. This

2.8 Pressurize air shaft with air to pull material from the take-up nip

rolls.

to it

- 2.9 Zero yardage counter and engage it by flipping it onto face of fabric.
- 2.10 Adjust take-up motor speed and clutch so material pulls smoothly under moderate tension.
  - 2.10.1 Feel tension across the web by hand.
- 2.10.2 If tension is uneven then adjust position of take-up shaft holder by turning support screws.
- 2.10.3 If running "tape" (355, or 349) have takeup wind as tightly as possible to facilitate easier slitting.
- 2.11 Recheck all settings on standard process sheet and note changes made.
- 2.12 Initial run sheet.

#### 3.0 Quality Control Weight Checks

- 3.1 One pass products and last pass on others.
- 3.1.1 When running a product which only gets one pass (i.e. Fluorpeel) or is on the last pass of any product cut a one foot full width sample before taping the web to the new core (Step 2.8). Make sure that this sample is not taken within 3 feet of the splice. Place ID label on left hand side of the sample and bring it to the lab.
  - 3.1.2 The I.D. label must state:
    Run Number
    Product Code Number

APPROVALS:	PRODUCTION	ENGINEERING	QUALITY CONTROL
ROOM			
AFFECTED AREAS: FABRIC TOWER		<b>EFFECTIVE DATE:</b> 11/14/96	
<b>SUBJECT:</b> FABRIC TOWER SHUTDOWN		NUMBER: FT-2	

#### **PROCEDURE**

**OBJECTIVE:** To institute a standard shutdown procedure for fabric coating tower operation.

**AFFECTED EQUIPMENT:** 

All PTFE coating towers.

#### STEPS:

- 1.0 **Shutting Down**
- 1.1 Stop web at end of material being coated.
- 1.2 Take core off air shaft and replace with leader.
- 1.3 Staple leader to tail end of fabric in the same manner as start-up procedure.
- 1.4 Fill air shaft with air and re-roll good material onto leader until tight.
- 1.5 Start to drain dispersion from dip pan into plastic buckets.
- 1.6 As leader goes through opposing metering bars, separate bars so staples do not cause any damage. Wipe all excess dispersion from splice. If necessary, stop machine momentarily to thoroughly wipe splice.
- 1.7 Continue to drain dip pan until empty. Lower pan from tower and clean thoroughly in sink.

- 1.8 Clean bottom bar, supports and metering bars thoroughly while running leader through tower.
- 1.9 When splice reaches trim blades, disengage blades and continue running material until splice reaches take-up roll.
- 1.10 When splice reaches yardage meter lift meter and record yardage of roll.
- 1.11 Shut off all heat zones set over 1,000°F so leader will not burn in tower.
- 1.12 Cut off splice at take-up and tape leader top new core on lower take-up. Put air in air shaft on lower take-up and continue to run leader through tower until 3 ft. of leader is left at entrance to tower. Shut off tower drive.
- 1.13 If the roll is to be coated another pass, move it around to payoff. If it is completed, put the roll on racks with other completed runs for inspection.
- 1.14 Follow procedures for clean up and setup for next pass or run.
- 1.15 If no other material is to be run, shut off all heats and allow time for blowers to cool tower down below 300 degrees before shutting the main breaker. This is especially important on hot air towers to prevent warpage in the oven and to avoid having a sprinkler go off above a tower.

SUBJECT: FABRIC TOWER CLEANING NUMBER: FT-3			
AFFECTED AREAS: Fabric Tower Room		<b>EFFECTIVE DATE:11/14/96</b>	
APPROVALS:	PRODUCTION	ENGINEERING	QUALITY
			CONTROL

#### **PROCEDURE**

**OBJECTIVE:** To establish a schedule of cleaning responsibilities for PTFE coating towers.

**AFFECTED EQUIPMENT:** 

All PTFE coating towers.

#### STEPS:

- 1.0 <u>Daily Cleaning</u>
- 1.1 When a run is completed (usually at least once per shift) the operator must remove and clean the coating pan and fill funnel. The bottom bar and supports must be thoroughly cleaned. The metering bars and spacers must be cleaned. All corrugated PTFE must be removed. Warm water and stainless steel wool should handle all clean ups. The steel wool should be used cautiously on the metering bars to avoid scratches.
- 1.2 All spills around the work area must be cleaned as soon as possible.
- 1.3 Nip rolls must be cleaned, or wiped down after each run.
- 1.4 Each operator is responsible for keeping his area clean on each shift. This includes all deck levels.
- 1.5 The floor around each tower must be swept or moped on each shift.
- 1.6 All creosote catch basins or spill pans must be emptied and cleaned. Bunny suits are available to keep clothes clean.
- 1.7 Any creosote on the outside of the tower must be cleaned. The source of any creosote leaks must be reported to the department manager of manufacturing engineer. All hanging lint must be vacuumed off the tower.

## 2.0 Weekly Cleaning

- 2.1 At least once per week according to production scheduling the operator will give the tower a thorough cleaning.
- 2.2 All dampers must be removed and cleaned.
- 2.3 All idler and nip rolls must be washed.
- 2.4 The enclosure around the coating head must be cleaned.
- 2.5 The control panel must be wiped down with a damp cloth to remove dirt, splashes, and finger smudges.

- 2.6 The operators' table must be neat. Unnecessary clutter will be cleaned up.
- 2.7 The floor must be cleaned of any spills, dirt, etc. The mats under the coating head should be changed if needed.

#### 3.0 **Periodic Maintenance Clean-Up**

- 3.1 On a periodic basis, each tower will be subjected to a complete clean-out by the maintenance dept. personnel. Every tower will therefore go through this clean-out once every eight weeks.
- 3.2 The maintenance people will remove all ductwork to be washed-out.
- 3.3 All duct catch basins will be cleaned out.
- 3.4 The exhaust fan(s) will be cleaned.
- 3.5 All dirt and residue will be blown out of the tower with compressed air.
- 3.6 Maintenance will remove all loose dirt from the tower and vacuum the floor around the tower.
- 3.7 Any creosote leaks in the ductwork must be sealed with caulking and tape. If this is not sufficient to prevent leakage, then it must be reported to the department manager or manufacturing engineer for further action.
- 3.8 Heater faces must be cleaned.

SUBJECT: Fabric To	ower Troubleshooting	NUMBER: FT-4	
AFFECTED AREAS: Fabric Tower Room		EFFECTIVE DATI	E: 11/14/96
APPROVALS:	PRODUCTION	ENGINEERING	Q.C.

#### **PROCEDURE**

**OBJECTIVE:** To establish standard procedures in attempting to correct poor quality product.

**AFFECTED EQUIPMENT:** All PTFE coating towers.

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1.0	Baggy Fabric
2.0	Bar Marks (Horizontal Lines)
3.0	Blisters (Small crater like surface defects)
4.0	Broken Filaments
5.0	Corrugated Fabric (Bands in machine direction)
6.0	Contamination on Fabric
7.0	Distorted Weave in Fabric
8.0	Foam Spots (Small bubbles on fabric)
9.0	Mud Cracks (The lab will use a microscope to see them)
10.0	Non-Wetting

11.0	Over Sintered Fabric (Ashen off- white color)
12.0	Runback
13.0	Smoke Coming From Tower
14.0	Unsintered Fabric (Chalky White sections)
15.0	Streaks (Vertical lines)
16.0	Wrinkles, Turkey Tracks
17.0	Uneven Roll Edge on Takeup
18.0	Smelly Mix
19.0	Low Adhesion Values (Peels) (You will not know this until after lab tests)
20.0	Low Dielectric Values (You will not know this until after lab tests)
21.0	Low Tensile Values (You will not know this until after lab tests)
22.0	Wrong Color (Too light or dark)
23.0	Orange Peel (All the web surface covered with small dimples)
24.0	Overweight
25.0	Scum
26.0	Chalky on TIO2 Passes (rubs off on finger)
27.0	High Edge Buildup
28.0	Curling Fabric
29.0	Streaking on Red
30.0	V Shaped Teflon Worms on Web (String like buildup of Teflon)
31.0	Ludox not Working

#### 1.0 Baggy Fabric

1.1 Check if roll is soft on one end. Press finger on bare roll to see if it was poorly at the factory. If excessive, reject the roll.

wound

- 1.2 Check for air in air shaft.
- 1.3 Make sure payoff and takeup rolls are in line with each other. On Towers 2,8,9 measure diagonally from the ends of the rolls. The measurements should be the same. Not centering the web will cause diagonal stress in the web as it tries to seek its own center. On towers that do not have the payoff and takeup on the same side, measure to the frame.
  - 1.4 Adjust position of roll at let off with set screw to reduce floppy edge.
  - 1.5 Adjust position of roll at take-up with set screw to wind roll more evenly.
- 1.6 Place bar just after let off at angle against fabric to reduce floppy edge going into dip pan.
  - 1.7 If baggy in middle, cut vertically into outer ends of raw glass roll to reduce the effect of a tight salvage edge.
  - 1.8 If still not tracking or creasing, reject the roll.

- 2.1 Adjust tension on brake at let off to stop "jumping" of fabric and smooth out pay-off.
  - 2.2 Adjust tension of take-up to smooth web travel.
  - 2.3 Nip roll not down.
  - 2.4 Stop and wash-up because bottom bar might be dirty. Bar must be sanded to eliminate roughness.
  - 2.5 Wash top roll. Creosote causes jumping when top roll is locked.
- 2.6 On towers with Magpower brakes and clutches spin them in reverse with drill adapter to repulverize magnetic powder.
  - 2.7 Bar marks and chatter may be caused by not enough teflon on 1<sup>st</sup> pass of 3 mil.

## 3.0 Blisters (Small crater like surface defects)

Blisters are caused by the mix spanning the holes in the web. When the air in the sealed holes heats up and expands, it blows out the weak side. The weak side hydraulically is the side that last sees the bar.

The trick to fighting blisters is to baby the air pockets into either not expanding to the point of blowing out or letting them blow out while the surface is still a liquid that can reseal itself. If you let them blow out after the material is scummed over, they will leave a crater. We don't want *any* heat in the bottom of the tower.

- 3.1 Make sure bottom baffles are closed as close as possible without hitting fabric.
- 3.2 **Turn down air input heat to 70 degrees**. On hot air ovens, turn off the zone heat.

bottom

3.3 If after another 30-40 yards it is still blistering, try turning the up the air blower speed.

input

3.4 Lower heats in bottom zones. On I/R ovens, lower zones 1 & 2,3,4,5 by (zones 1 & 2 in Tower # 6).

50°F

3.5 If it is still blistering, try *lowering* the hot air input speed to 80%, it may be out the web too early.

drying

- 3.6 If after 30-40 yards, it is still blistering, slow the web speed.
- 3.7 Check metering bars to see that dispersion is being applied evenly. If not, try offset wipe bars. If using offset bars, try changing your wipe angle. If still blistering try going to opposing bars.
  - 3.8 If using wire bars, go to smooth bars to decrease the amount of coating being applied.
  - 3.9 Check the ph of the mix, if it is high, there may be too much ammonia in it. Ammonia has a low boiling point. Switch to a lower ph mix.
  - 3.10 Microblisters (very small blisters) can be caused by teflon shearing on the pan turnaround roll. The sheared, partially coagulated mix is more viscous, resulting in a tendency to leave a rough, microblistered coating on one side of the web. Refer to section 30 on sheared teflon.
  - 3.11 Blisters can be caused by wrong temperature on unsintered passes. If the web is overcured, the calender can't force the teflon into the holes, letting the holes trap more air.
  - 3.12 If still blistering, stop, take it off the tower and go to the next order. Reschedule blistering run such that engineering/ production manager can

oversee it.

## 4.0 **Broken Filaments**

- 4.1 If excessive amounts reject roll for return to vendor.
- 4.2 If on tower with static vacuum, make sure its on and operating properly. What appears to be broken filaments is sometimes surface lint.
- 4.3 If running unsintered (semifused) on a hot air tower, keep the temperatures as high as possible without sintering (fusing). This will allow the calender to hammer the defects flat without picking off the coating.
- 4.4 If you have to run a roll with broken filaments, run an extra pass unsintered or run viscosified for last 2 unsintered passes to build up an unsintered base of teflon to calender the broken filaments into.

## 5.0 Corrugated Fabric (Bands in machine direction)

- 5.1 Too thick of a mix, letting stationary bubbles on top of the coating bar pull at the surface of the passing web, causing lines. Check and adjust viscosity as indicated on setup sheets, where applicable.
- 5.2 Check the hot air input temperature. If the top wiper bar is warm, or there excessive drying on the bar, reduce the temperature and airflow of the hot air input.
  - 5.3 Uneven pickup. To fix, go to offset wipe metering bars.
  - 5.4 Not enough tension across bars.
- 5.5 Mix has settled. Make sure mix is paddled in barrel before dipping, otherwise the bottom of the barrel will be too high a viscosity.
  - 5.6 Clean bottom and metering bars, accumulated lumps may cause corrugations.

#### 6.0 Contamination on Fabric

- 6.1 Check bare glass for flaws and dirt, if excessive, reject roll.
- 6.2 If not in bare glass drain and refilter dispersion. Make sure filter is in place.
- 6.3 If continued clean all rolls in tower and use a new mix.
- 6.4 Clean drip pans, baffles and hood if you think it may be creosote drops.
- 6.5 Check for web hitting side of oven. If it is hitting, try the following;

  Raise tension, check that all blowers are running, reduce blower speeds, adjust baffles.

  If it still is hitting, cut the web and flip it. It might be baggier on one side. It also helps to go to a different payoff if the tower is equipped with dual payoffs.
- 6.6 Chunks from heavy glob of dispersion on fabric usually caused by moving the web without the wiper bars in place. The glob dries out in the oven, flakes off, and falls back into pan, causing chunks.
- 6.7 Do not let pan run down and dry on, then refill. Refilling will float the chunks free, and on to the web.
  - 6.8 Check for teflon shearing, refer to section 30.
  - 6.9 If creosote, determine if it is cured or uncured by wiping it. If it is cured, it is either from a previous pass, dripping onto the payoff side or dripping onto the web in the bottom of the oven. If it is uncured, it is dripping onto it in the top of the oven or on the takeup side. Clean the hood and trays. Make sure the air bars are clean. They will spray creosote if dirty. If you are not running a lightweight glass that is subject to creasing, the cooling air bars should be off to prevent them from condensing creosote.

#### 7.0 Distorted Weave in Fabric

- 7.1 Make sure glass was handled properly from warehouse to payoff.
- 7.2 Check weave in bare glass and reject roll if severely distorted.
- 7.3 Check for air in air shafts.
- 7.4 Make sure payoff and takeup rolls are in line with each other. On Towers 2,8,9 measure diagonally from the ends of the rolls. The measurements should be the same. Not centering the web will cause diagonal stress in the web as it tries to seek its own center. On towers that do not have the payoff and takeup on the same side, measure to the frame.
  - 7.5 Adjust tension on let off to lessen amount of pull on fabric.
  - 7.6 Check web path to make sure fabric isn't rubbing against anything (i.e. baffles).
  - 7.7 Make sure splice is even across web.

## 8.0 Foam Spots (small bubbles on fabric)

8.1 Skim foam from top of dispersion in pan if noticeable. Do not start tower until has been skimmed off.

foam

8.2 Adjust specific gravity in pan and clean bars. As the mix gets viscous it pulls bubbles from the top of the bars. If it is a dip, skip this step.

- 8.3 If it is showing up at the takeup, try knife bars to stop it from going up the
- tower.
- 8.4 Turn up air flow from air inputs to break bubbles before they dry (towers 1,5,6,7,8). Do not raise hot air temperature. It should not go over 70 deg., wiper bars must <u>not</u> get warm or there is a high risk of scum. On tower 8, put floor fan to blow bubbles to one end of pan, and also to help break bubbles going up. On Tower 8 you can also try using the top pan mixer to pull the foam to one end.
- 8.5 Slow machine down 2 fpm until foam disappears at takeup (check web leaving oven to see change results quicker).
  - 8.6 Reduce gap of metering bars.
  - 8.7 If on an offset wipe, try a different wipe angle. Be careful though, this can lead to mudcracking if you put too much on at a pass.
- 8.8 If you have foam on edge of material and that edge is baggy in the back of the you need to adjust to take bag out of material so foam will disappear.
- 8.9 Surfactant is not fully baked off from last pass. Drypass the material. If it's a semifuse pass, make sure you raise the heats until it just starts going sintered in spots, then back down the heat.
- 8.10 If still foaming after semifuse drypass, try a fused drypass, then run product up with sintered passes. This only works on material that does not have a lot of broken filaments as we will not be able to calender it.
  - 8.11 If running AD1S, switch to T30 45%.
  - 8.12 If at 45%, go to 30% mix.
  - 8.13 Try changing tension in the web.
- 8.14 If foaming is not reduced to an acceptable level, switch to a new order, and we will reschedule the foaming run so engineering or production manager can monitor the run...

# 9.0 Mud Cracks (You will have to use a microscope to see them. This problem is normally only noticed by the lab.)

- 9.1 Putting too much on in one pass. Reduce metering gap if using opposing bars. If using offset wires, go to smooth.
- 9.2 Lower heats in zone 1 & 2 on I/R towers by 50°F.
- 9.3 Turn air inputs up to 100%.
- 9.4 Add more Triton X-100 surfactant.
- 9.5 Use Dupont T30 dispersion instead of ICI AD1S, it seems to crack less. If on unsintered use ICI AD639.
- 9.6 If it is a thickened mix, make sure the acrysol was in the mix. It acts as a bonding agent allowing thicker passes of teflon without cracking.
- 9.7 Slow line speed.

Mudcracks lower dielectric values on electrical grade material, cause plastic to stick on heat sealing material, cause grease to penetrate and lift teflon on food cooking material.

## 10.0 Non-Wetting

- 10.1 Wrong mix. Make sure you are using a high surfactant mix, typically a 54.5% AD639 or T30B mix, if clear coating with standard techniques.
- 10.1 Add 1 oz. FC-143 and 1 oz. L-77 to 30 lbs of dispersion.
- 10.2 Dry pass if wetting agent does not work.
- 10.3 If it is a silicon first pass, and the non-wetting looks like little clear spots, refer to section 32, Silicone spots.

## 11.0 Over Sintered Fabric (ashen off-white color)

- 11.1 Lower heats in sintering zones. (See wall chart to determine proper zones). Notify engineering or production manager of problem. Setup sheet targets may need to be shifted or you could have a run away heater, or a new heater/controller that is not tuned properly.
- 11.2 If you are not sure if it is oversintered or undersintered, scrape it with your fingernail, if it scrapes off, its undersintered. If in doubt, have the lab run a DSC test to see if it is sintered.

## 12.0 Runback

- 12.1 If raw glass rolls have creases, reject raw glass.
- 12.2 If dip, go to offset wires, if offset, go to smooth bars.
- 12.3 Reduce metering bar gap if using opposing bars.
- 12.4 Make sure tension is correct on payoff roll.
- 12.5 Slow machine line speed.
- 12.6 Make sure fabric is not hitting on baffles.
- 12.7 Make sure speed is uniform and not jerking through tower. Check payoff brake.
- 12.8 Make sure mix viscosity is correct.
- 12.9 If runback is coming from bar marks close together, it may be flutter caused by the air input blower, lower air input blower speed.
- 12.9 If you can't correct, STOP.

## 13.0 Smoke Coming From Tower

- 13.1 Make sure exhaust fan is turned on. If in doubt that belts are good, check that blower shaft is turning.
- 13.2 Call maintenance or engineering.

- 13.3 Check baffle leading to exhaust.
- 13.4 Open bottom baffle to increase air flow.
- 13.5 After any of the above changes, watch fabric for fused or semifused condition. You may need to raise the heats.

## 14.0 <u>Unsintered Fabric (Chalky White sections)</u>

(Make sure its unsintered by seeing if it comes off on your finger nail).

1. Raise temperatures in sintering zones (see wall chart to determine

proper zones).

- 2. Check heat controls for power failure.
- 3. Shut down the run and call maintenance to check the tower out.
- 4. On Tower 8, make sure Zone 4 exhaust is set to proper setting. It may be much cold air into the top of the oven. Also check the oven tower for a tight seal.

sucking too exit sealing flap on top of the

- 5. Semifused (unsintered) material should be baked to the point were it is as close to being cured as possible to prevent picking on the calender. To do this raise the temperatures until the material looks like a zebra, with some areas fusing (sintering). Then back down the temperature slightly. The web should have a light coffee color, with coating still able to easily scratch off beneath your finger nail.
- 6. If in doubt, have the lab do a DSC test on a small sample to see if its sintered.
- 7. If coming down unsintered on tower 2, open the slide baffles on top of the tower full open. Then check to make sure web is still centered in the oven front to back.
- 8. On hot air towers, tower may need cleaning. When nozzles get plugged up, they can't transfer the heat.

#### 15.0 Streaks (vertical lines)

- 15.1 Check that the web is not dragging on a baffle.
- 15.2 Check to make sure it's not in fabric if it is, reject roll.
- 15.3 If dip, go to opposing bars.
- 15.4 Check for contamination in metering gap if using opposing bars.
- 15.5 Drain and refilter dispersion (wipe down bottom bar).
- 15.6 Top coating bar drying out. Clean bars.
- 15.7 Improper mix viscosity, usually too low. Change or dilute mix.
- 15.8 Uneven splice.
- 15.9 If web seems to be off-centered in tower, check that the offset bars are in the right position.
- 15.10 If using 57% mix, do not use smooth bars.

#### 16.0 Wrinkles, Turkey Tracks

- 16.1 Check if roll is soft on one end. Press finger on bare roll to see if it was poorly at the factory. If excessive, reject the roll.
- wound

- 16.2 Check for air in air shaft.
- 16.3 Make sure payoff and takeup rolls are in line with each other. On Towers 2,8,9 measure diagonally from the ends of the rolls. The measurements should be the same. Not centering the web will cause diagonal stress in the web as it tries to seek its own center. On towers that do not have the pay off and takeup on the same side, measure to the frame.
  - 16.4 Adjust tension on let off and take-up. Usually lower tension reduces creases.
  - 16.5 Lock head roll. If this doesn't help, progressively lock more idler rolls.
  - 16.6 Turkey tracks are often caused by the fabric cooling off on the edges before the middle before it goes over the headroll. This contraction of the outer edges causes the middle to have excess material by comparison and crease. On I/R ovens (1,3,5,7) hookup air cooling bar (if available) to evenly cool material before going over head roll. Prop open hood door. If necessary, set a portable fan blowing into hood. On Tower 8, 9 or 2, open the cupola louvers to help cool the web before it hits the headroll.
  - 16.7 Adjust take-up roll using set screws.
  - 16.8 If baggy in middle, cut vertically into outer ends of raw glass roll to reduce the effect of a tight salvage edge.
  - 16.9 If creasing, raise nip roll then lower it again.

# 17.0 Uneven Roll Edge on Takeup

- 17.1 Check for air in air shaft.
- 17.2 If tower is equipped with air guide, check for the following;
  - 17.2.1 Unit is on.
  - 17.2.2 Unit is in auto, not in center.
  - 17.2.3 Fabric is aligned in the finger guide.
  - 17.2.4 Hydraulic guide roll has not exceeded its travel limit.
  - 17.2.5 Material has walked to one end of headroll.
- 17.3 Takeup is not providing enough tension as the roll size increases.

#### 18.0 Smelly Mix

- 18.1 Microbes are eating the organics in the mix. All mixes should have ammonia added to them to keep their ph at 9-10 to kill microbes. Mixes containing gelatin are especially susceptible. They should have a layer of ammonia poured on top of the mix when it is returned to the mix room for storage. For low solids and slow moving mixes Ph 10 is critical.
  - 18.2 Mixes that are very smelly should not be used, they should be disposed of . Running them on a tower will produce smells outside of the plant. These smells may offend a neighbor.

## 19.0 Low Adhesion Values (peels) (You will not know this until after lab tests)

19.1 Improper sizing or finish on bare glass. Check sizing and finish from glass manufacturers. Different binders and sizings are used to allow the brittle glass to be handled during

weaving. Finishes are applied to the bare glass to allow different user applications.

certain bonding characteristics in

- 19.2 Too much silicone used in mix on 1st pass.
- 19.3 Too high of calender pressure.

# 20.0 Low Dielectric Values (You will not know this until after lab tests)

- 20.1 Mudcracking from not using smooth bars.
- 20.2 Mudcracking from too light an offset wipe.
- 20.3 Mudcracking from specific gravity climbing too high.
- 20.4 Pin holes in material from blistering.

## 21.0 Low Tensile Values (You will not know this until after lab tests)

- 21.1 Wrong glass style used. Single weaves are weaker than twisted weaves.
- 21.2 Raw glass heat cleaned at too high a temperature.
- 21.3 Coated at too high a temperature.
- 21.4 Not enough silicone used in mix. Silicone allows the fiber bundles to slip against each other. This allows them to share the load evenly.
- 21.5 Not enough buffer passes before abrasive TIO2 passes. TIO2 will cut into glass bundles, reducing it's strength. This can also happen with black.
- 21.6 Too high a calender pressure.

## 22.0 Wrong Color (too dark or light)

22.1 Wrong glass finish. Heat cleaned or CHT (continuous heat cleaning) glass will come out whiter than greige (not heat cleaned) glass. Greige glass fabric contains binders on both the warp (web length direction) and fill (cross web direction) yarns from the glass manufacturing process as well as additional lubricants (size) which are added to the warp yarn in the slashing process. The binders typically contain starch and an oil based product while the size contains primarily PVA (polyvinyl alcohol). When the fabric is heat cleaned, the organic binder and size is volatilized leaving only glass with a trace of residual organic content.

If you think the glass has been misslabeled from the manufacturer, have a process engineer do an iodine test on the bare glass. If it has starch and PVA still in it, it will turn purple. Heat cleaned will not turn color.

- 22.2 Wrong mix used. Some products require mixes containing a coloring agent or gelatin to pigment the product. Gelatin and polyvinyl alcohol burn off during processing, the by products left color the fabric.
- 22.3 Wrong heat.
- 22.4 If pigment is streaking, it could be the dry pigment was not predispersed in water with homogenizer mixer before adding Teflon and fillers.

23.1 Putting too much on each pass.

## 24.0 Overweight

- 24.1 Slow web speed. This gives more time for dispersion to run off web.
- 24.2 If it is only going slightly overweight, don't worry about it. The only exceptions to this is if is laminate or other specialty material. If in doubt, ask the process engineer or manufacturing manager.
- 24.3 Change to smooth bars.
- 24.4 Change to a lower solids mix.

#### 25.0 **Scum**

- 25.1 Letting level get too low in pan, letting mix dry on sides and being floated when refilled.
- 25.2 Being dried out by heat coming out of the bottom of the tower. Coating bars should not be warm! Too high a blower speed on hot air input blower, try not to go over 85% blower speed and lower air input heat to 70 degrees. Too high a temperature on lower zones. On I/R ovens (1,3,5,6,7), make sure baffles are as tight as possible to web, and that ends are taped.
- 25.3 If scum has formed in pan, stop the run and wash the pan, regardless of how far in the run you are!
  - 25.4 Cover ends of pan with cardboard or saran wrap.
- 25.5 Insufficient mixer speed on black or thickened mixes, or feed drum not paddle stirred prior to adding mix to pan.
  - 25.6 Mix viscosity too high, adjust during run if necessary.
  - 25.7 Not washing the pan at proper intervals.
- 25.8 If scum looks like stringy pieces of teflon, often in an upside down V shape, refer to 30. Teflon Worms. Even if it doesn't look like this, it still may be the teflon is shearing (section 30).

# 26.0 Chalky on TIO2 Passes (rubs off on finger)

- 26.1 High TIO2 load or low teflon solids. Don't worry about it. Final FEP pass will take care of it.
  - 26.2 Undispersed TIO2 lumps. Stop and remix and refill after cleanup.

26.3 Overtemp in sintering zones. Check for proper heats.

## 27. High Edge Buildup

High edge buildup is usually caused by dull cutting knifes fraying the edges and the edges picking up more Teflon or multiple passes with smooth bars. On each pass the meniscus builds up on the edge. The fewer passes you can build to weight with, the better.

- 27.1 Move edge guide to side slightly to offset overwrap.
- 27.2 Edge trim twice if possible.
- 27.2 Pad with cardboard. Make sure cardboard goes the full width of web to avoid end collapse on later wraps, see 27.4.

- 27.3 Cut into two rolls length wise.
- 27.4 **Do not** use a short core. It cures the edge buildup but causes a worse problem wrinkling the edges of the material.

by

27.5 Use edge wipes to reduce edge pickup each pass. These can consist of 14 mil material with a slot cut in them.

# 28. Curling Fabric

28.1 Usually occurs when coating single sided. Run smooth bar on one side, wire the side you want to pull the curl back to.

bar on

28.2 If using opposed bars check centering of web in metering bars.

# 29. Streaking on Red

- 29.1 Make sure coating bar is not warm.
- 29.2 Bottom baffles should be tight to web.
- 29.3 Tower room doors closed.
- 29.4 Check viscosity in pan, should be 600-700cps.
- 29.5 If still a problem, stop run.
- 29.6 Make sure red pigment is properly dispersed.

## 30. V Shaped Teflon Worms On Web (string like buildup of teflon)

Teflon is shearing (separating from mix)on turnaround bar or metering bar.

- 30.1 Slow web speed.
- 30.2 Clean pan and change dispersion.
- 30.3 Sand bottom bar and smooth metering bars. If necessary rechrome turnaround bars. If possible rotate bar.
  - 30.4 If possible reduce tension.
  - 30.5 Fabric too rough.
  - 30.6 Dispersion too cold or hot.
  - 30.7 Try new mix. Mix may have been used too much.
  - 30.8 Try cutting the specific gravity.
  - 30.9 Check raw glass, it may be dusty, (too much sizing or loose fly).
  - 30.9 Try knife bars with a very steep angle and loose wipe. The sheared teflon will not have a place to roll into worms with a knife.

## 31. Ludox not Working

(Ludox works by using PFA dispersion to "glue" silica crystals onto web. This allows adhesive to stick to web when processed into tape).

- 31.1 Drip ran out. Use pump to insure sufficient flow.
- 31.2 Too high a concentration, causing too thick of a coating.
- 31.3 Fabric too rough. Causes Ludox crystals to fall into valleys of weave.
- 31.4 Metering bars must press flat across web, curled, creased webs will pick up too much Ludox unless the wipe is tight enough to press these areas flat. If it does not, do not use this roll for Ludoxing.

On all problems, if in doubt, don't hesitate to use the stop button and ask for help. Better to lose some inaterial stopping it, than to lose the entire roll.

All operators please sign below that you have read this book and understand it. You are responsible to continually monitor the product and where necessary take appropriate action to maintain product quality.

Any problems must be noted on the runsheet along with what actions were taken to correct the problem.